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STATISTICS HSSC-II

SECTION – A (Marks 17)

Time allowed: 25 Minutes

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Note: Section – A is compulsory. All parts of this section are to be answered on the separately provided OMR Answer Sheet which should be completed in the first 25 minutes and handed over to the Centre Superintendent. Deleting/overwriting is not allowed. Do not use lead pencil.

Q. 1 Choose the correct answer A / B / C / D by filling the relevant bubble for each question on the OMR Answer Sheet according to the instructions given there. Each part carries one mark.

- 1) An arrangement of objects in a definite order is called:
A. Permutation B. Combination C. Set D. Mutually exclusive
- 2) If events A and B are mutually exclusive then:
A. $A \cap B = S$ B. $A \cup B = \phi$ C. $A \cap B = \phi$ D. $A \cap B = 1$
- 3) Median of the Binomial distribution $\left(\frac{1}{2} + \frac{1}{2}\right)^{20}$ will be:
A. $\frac{1}{2}$ B. $\frac{1}{20}$ C. 5 D. 10
- 4) A coin is tossed three times; the total number of possible outcomes will be:
A. 1^3 B. 2^3 C. 3^2 D. 3^3
- 5) Which of the following **CANNOT** be taken as probability of an event?
A. 0 B. 0.5 C. 1 D. -1
- 6) Given $E(X) = 5$ and $E(Y) = 2$, then $E(X - Y)$ is:
A. 3 B. 7 C. 5 D. -2
- 7) If X and Y are independent random variables, then $Var(X - Y)$ is equal to:
A. $Var(X) - Var(Y)$ B. $Var(X) \times Var(Y)$
C. $Var(X) + Var(Y)$ D. $E(X - Y)^2$
- 8) Normal distribution has maximum ordinate at $X =$
A. 0 B. μ C. 1 D. σ
- 9) Standard deviation of standard normal distribution is:
A. 0 B. 2 C. 1 D. 3
- 10) When sampling is done with or without replacement, $\mu_{\bar{X}_1 - \bar{X}_2}$ is equal to:
A. $\mu_1 - \mu_2$ B. $\mu_1 + \mu_2$ C. $\mu_2 - \mu_1$ D. $\sigma_1 - \sigma_2$
- 11) Level of confidence is denoted by:
A. α B. $1 - \alpha$ C. β D. $1 - \beta$
- 12) If $1 - \alpha = 0.90$, then value of $Z_{\frac{\alpha}{2}}$ is:
A. 2.33 B. 2.58 C. 1.96 D. 1.645
- 13) By which of the following symbols is type- I error represented?
A. ϕ B. β C. α D. μ
- 14) A contingency table is made up of 8 rows and 4 columns. How many degrees of freedom are present?
A. 21 B. 32 C. 12 D. 10
- 15) The total area under the curve of a chi-square distributions is:
A. 0.5 B. 1 C. 0 to ∞ D. $-\infty$ to $+\infty$
- 16) Drag and drop is a term associated with:
A. Scanner B. Keyboard C. Printer D. Mouse
- 17) Which of the following may **NOT** be a binary number?
A. 101 B. 202 C. 110 D. 001

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STATISTICS HSSC-II

47

Time allowed: 2:35 Hours

Total Marks Sections B and C: 68

NOTE: Answer any fourteen parts from Section 'B' and any two questions from Section 'C'. Use supplementary answer sheet i.e. Sheet-B if required. Write your answers neatly and legibly. Statistical table will be provided on demand.

SECTION - B (Marks 42)

Q. 2 Attempt any FOURTEEN parts. All parts carry equal marks.

(14 x 3 = 42)

- (i) How many possible permutations can be formed from the following words?
(a) COMMISSION (b) COMMITTEE
- (ii) What is the difference between independent and dependent events? Give an example of each.
- (iii) Given $P(A \cap B) = \frac{3}{5}$, then find $P(\bar{A} \cup \bar{B})$.
- (iv) Given $E(X) = 0.55$, $Var(X) = 1.55$ and $Y = 2X + 1$. Find $E(Y)$ and $Var(Y)$.
- (v) A continuous random variable X which can assume values between $x = 2$ and $x = 8$ has a density function given by $f(x) = k(x + 3)$ where k is constant. Find (a) k (b) $P(x = 5.5)$.
- (vi) A random variable X has a binomial distribution with $E(X) = 2.4$ and $p = 0.3$. Find the standard deviation of X .
- (vii) State any three properties of the binomial experiment.
- (viii) If $N = 52$, $n = 13$ and $k = 12$. Find the standard deviation of hypergeometric distribution.
- (ix) The standard deviation of a normal distribution is 2. Find its first four moments about mean.
- (x) A fair coin is tossed four times. What is the probability of getting exactly two heads?
- (xi) State any three properties of the normal distribution.
- (xii) Given $n_1 = 2$, $n_2 = 2$, $\mu_1 = 6$, $\mu_2 = 2$, $\sigma_1^2 = 2.67$, $\sigma_2^2 = 0.67$. Find $\mu_{\bar{X}_1 - \bar{X}_2}$ and $\sigma_{\bar{X}_1 - \bar{X}_2}^2$.
- (xiii) What is the value of finite population correction factor (f.p.c) when $n = 18$ and $N = 125$?
- (xiv) Differentiate between sampling with replacement and sampling without replacement.
- (xv) Given $n = 64$, $\bar{X} = 42.7$, $\sigma = 8$ and $Z_{\frac{\alpha}{2}} = 1.645$. Find confidence interval of μ .
- (xvi) Given $n_1 = 48$, $\bar{X}_1 = 90$, $n_2 = 72$, $\bar{X}_2 = 85$, $S_1^2 = 12$, $S_2^2 = 18$, $Z_{\frac{\alpha}{2}} = 1.96$. Find 95% confidence interval for $\mu_1 - \mu_2$.
- (xvii) Formulate the null and alternative hypotheses in each of the following.
 - (a) A research organization reports that 9% of all grocery shoppers never buy the store brand.
 - (b) The average cost of a LED TV is not more than Rs.40,000/-
- (xviii) If $(A) = 240$, $(B) = 270$, $N = 600$. What would be the number of (AB) if A and B are independent?
- (xix) Differentiate between RAM and ROM.

SECTION – C (Marks 26)

Note: Attempt any TWO questions. All questions carry equal marks. (2 x 13 = 26)

- Q. 3** a. Write a set ' H ' containing all vowels in the word "PUBLICATION", and then find the probability of ' H '.
Using the $P(H)$, find the probability of consonants. (05)
- b. Find the mean, variance and standard deviation of the binomial distribution $(q + p)^3$. (08)
- Q. 4** a. In a normal distribution, the mean and standard deviation are 0 and 1 respectively. Write down its equation and find the value of the maximum ordinate correct to four decimal places. (04)
- b. A population consists of values 2, 2, 8. (09)
- (i) Draw all possible samples of size 2 with replacement. Calculate the mean of each sample.
(ii) Form a frequency distribution of \bar{X} .
(iii) Find the mean and variance of the sampling distribution of \bar{X} .
(iv) Find the mean μ and the variance σ^2 of the given population.
(v) Show that the population mean is equal to the mean of means of all samples.
(vi) Show that population variance is twice the variance of sample means.
- Q. 5** a. A manufacturing company making automobile tires claims that the average life of its product is at least 35000 miles. A random sample of 16 tires was selected; and it was found that the mean life was 34000 miles with a standard deviation $s = 2000$ miles. Test hypothesis $H_0 : \mu \geq 35000$ at $\alpha = 0.05$ (05)
- b. Four hundred and ninety-two candidates for scientific posts gave particulars of their college degrees and their hobbies. The degrees were in either mathematics, statistics or economics, and the hobbies could be classified roughly as music, craftwork, reading or drama. The data are presented concisely in the following contingency table. (08)

Categories	Mathematics	Statistics	Economics
Music	24	83	17
Craftwork	11	62	28
Reading	42	147	78

Discuss the association between the two criteria of classification; i.e the degrees and the hobbies.

Use $\alpha = 0.05$